## CLAIMS

1. A method of gating radiation for a computed tomography procedure, comprising:

measuring a first set of signal data representative of a physiological movement of a patient during a first time period;

5       pattern matching the first set of signal data with a second set of signal data related to measured physiological movement of a patient during a second time period to identify degree of deviation from periodicity of the physiological movement; and

gating radiation to the patient if the degree of deviation from periodicity exceeds a threshold based upon results of the pattern matching.

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2. The method of claim 1 in which the first set of signal data and the second set of signal data are pattern matched using an autocorrelation function.

3. The method of claim 1 in which the first set of signal data and the second set of 15     signal data are pattern matched using an absolute difference function.

4. The method of claim 1 further comprising:

determining a degree of match between the first set of signal data and the second set of signal data.

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5. The method of claim 4 in which the degree of match is determined by a secondary peak value of an autocorrelation function.

6.    The method of claim 4 in which the degree of match is determined by a secondary minimum value of an absolute difference function.

5    7.    The method of claim 4 further comprising:

comparing the degree of match to a threshold range.

8.    The method of claim 7 in which the degree of match outside the threshold range indicates deviation from a normal physiological movement.

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9.    The method of claim 7 in which the degree of match within the threshold range indicates a repetitive physiological movement.

10.    The method of claim 9 in which a point of best match indicates a period of the

15    physiological movement.

11.    The method of claim 1 further comprising:

predicting a period of the physiological movement during a third time period.

20    12.    The method of claim 11 further comprising:

predictively actuating a gating system component based upon the predicted period.

13.    The method of claim 1 further comprising:

determining a period of the physiological movement.

14.    The method of claim 13 further comprising;

5        defining a treatment interval to apply radiation to a patient.

15.    The method of claim 14 in which the treatment interval is defined by phase of the

physiological movement.

10    16.    The method of claim 1 in which the second set of signal data is a data model of the

physiological movement of the patient.

17.    A method for physiological gating comprising:

determining a period of physiological movement;

15        physiological gating in an interval range based upon phase of the period of the

physiological movement.

18.    The method of claim 17 in which the period of physiological movement is

determined by pattern matching a first set of data representative of the physiological

20    movement during a first time period with a second set of data related to the physiological

movement during a second time period.

19.     The method of claim 18 in which the first set of data and the second set of data are pattern matched using an autocorrelation function.

20.     The method of claim 18 in which the first set of data and the second set of data are
5     pattern matched using an absolute difference function.

21.     A method of gating radiation for a computed tomography procedure, comprising:

determining a period of periodic physiological movement;

determining an amount of time required to actuate a gating component for a
10     computed tomography radiation device;

defining an interval range for applying radiation, the interval range defined over a

portion of the period of the periodic physiological movement; and

predictively actuating the gating component to compensate for the amount of time

required to actuate the gating component.
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22.     The method of claim 21 in which said gating component is a switch operatively

coupled to a radiation source.

23.     The method of claim 21 further comprising:
20     predicting a next period of physiological movement.

24.    The method of claim 23 in which the interval range is defined over the physiological movement.

25.    The method of claim 24 in which the gating component is predictively actuated to

5    coincide the full actuation of the gating component with a boundary of the interval range.

26 .    A method of gating the application of radiation for a CT procedure, comprising:

measuring signal data representative of at least a portion of a  physiological

movement to form a set of ordered measurement samples;

10    pattern matching the set of ordered measurement samples against prior measurement

samples of the physiological movement to determine deviation from periodicity of the set of

ordered measurement samples; and

gating CT radiation to the patient if the deviation from periodicity is outside a

threshold range.

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27.    The method of claim 26 in which the second set of ordered measurement samples

overlaps with the prior measurement samples.

28.    The method of claim 26 in which the step of pattern matching comprises shifting the

20    set of ordered measurement samples against the prior measurement samples at a plurality of

offset sample positions to determine position of best match.

29.    The method of claim 28 in which an absolute difference function is used to
determine the position of best match.

30.    The method of claim 26 further comprising:

5          determining a predicted value for an additional measurement sample for the
physiological movement.

31.    The method of claim 30 in which radiation gating occurs if the predicted value
deviates from the additional measurement sample beyond a designated threshold level.

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32.    The method of claim 28 in which a search range for position of best match is
established based upon a predicted position, in which the predicted position is based upon a
period established from the prior measurement samples.

15    33.    The method of claim 26 in which the physiological movement comprises breathing
movement.

34 .    The method of claim 26 in which pattern matching is performed using an
autocorrelation function.

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35.    The method of claim 26 in which pattern matching is performed using an absolute
difference function.

36.    The method of claim 26 further comprising;

defining an interval range to apply radiation to a patient.

5    37.    The method of claim 36 in which the interval range is defined based upon phase of

the physiological movement.

38.    A method of gating radiation, comprising:

receiving a set of signal data representative of a physiological movement of a patient;

10    estimating phase of the set of signal data;

comparing a vector of the set of signal data with one or more prior sets of signal data

to identify deviation from periodicity of the physiological movement, the vector of the set of

signal data based upon the phase, the one or more prior sets relating to measured

physiological movement of a patient during one or more prior time periods; and

15    gating radiation to the patient if the deviation from periodicity is identified.

39.    The method of claim 38 in which the phase is estimated by calculating period of the

set of signal data.

20    40.    The method of claim 39 further comprising

computing an inner product of a Cosine waveform with the period T and most recent

T-seconds-long segment of the signal data to form an in-phase component;

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computing the inner product with a Sine waveform of the period T to form a

quadrature component; and

computing the inverse Tangent of result of dividing the quadrature component by the

in-phase component to estimate the phase.

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41.    The method of claim 39 further comprising:

identifying an assumption for the period;

estimate location values for maximum and minimum values; and

based upon one or more sample sets, estimating the period.

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42.    The method of claim 38 in which the vector comprises amplitude and phase

components.

43.    The method of claim 38 in which the act of comparing the vector of the set of signal

15    data with the one or more prior sets of signal data to identify deviation from periodicity of

the physiological movement comprises:

using a 2-dimensional histogram array of signal versus phase values.

44.    The method of claim 43 in which the 2-dimensional histogram array is accumulated

20    during prior recordings of the physiological movement.

45.    The method of claim 43 further comprising:

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comparing the vector against with other values in the 2-dimensional histogram array;

forming a clustering factor; and

identifying deviation from periodicity if clustering factor exceeds a threshold.

5    46.    The method of claim 38 in which the physiological movement comprises respiration

activity.

47.    The method of claim 46 further comprising:

estimating latest inhale values, latest exhale extreme values, and corresponding time

10    points.

48.    The method of claim 38 in which the radiation comprises therapeutic radiation.

49.    The method of claim 38 in which the radiation relates to a CT procedure.

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50.    A method for gating a medical procedure, comprising:

collecting data samples for a physiological activity;

analyzing the data samples to identify deviation from periodicity; and

gating the medical procedure if deviation from periodicity is identified.

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51.    The method of claim 50 in which the act of gating the medical procedure comprises

gating the application of radiation.

52.     The method of claim 51 in which the medical procedure comprises a computed tomography procedure.

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53.     The method of claim 51 in which the medical procedure comprises a radiotherapy procedure.

54.     The method of claim 50 in which the act of gating the medical procedure comprises

10      gating of data acquisition.

55.     The method of claim 54 in which gating of data acquisition comprises binning data.

56.     The method of claim 54 in which the medical procedure comprises an emission

15      imaging method.

57.     The method of claim 56 in which the emission imaging method comprises an MRI procedure.

20  58.     The method of claim 56 in which the emission imaging method comprises a PET procedure.

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59. The method of claim 50 in which gating is performed retrospectively.

60. A method for physiological gating, comprising:

   co-locating a marker block with a patient, the marker block comprising two or more

5 markers;

   viewing the marker block with a camera;

   generating image data representative of the marker block; and

   gating based upon the image data.

10 61. The method of claim 60 in which the marker block comprises two markers.

62. The method of claim 61 in which the marker block is positioned such that the two

   markers are both simultaneously viewed by the camera.

15 63. The method of claim 61 in which positions of the two or more markers are tracked

   using the image data.

64. The method of claim 60 further comprising:

   quantifying movement for the marker block.

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65. The method of claim 64 in which a range interval for gating is based upon the

   movement of the marker block.

66.     The method of claim 65 in which gating is performed based upon amplitude of

movement data.

5     67.     The method of claim 65 in which gating is performed based upon deviation from

periodicity of the movement data.

68.     The method of claim 64 further comprising:

identifying physical distance between the two or more markers; and

10     determining a scale factor using the physical distance, the scale factor used for

transforming incremental motion of the marker block viewed by the camera into the physical

domain;

69.     A method for gating a computed tomography procedure, comprising:

15     directing a camera at a patient;

viewing physiological movement by the patient;

generating image data representative of the physiological movement by the patient;

analyzing the image data against an established range interval for applying radiation;

and

20     gating radiation to the patient based upon analysis of the image data.

70.     The method of claim 69 further comprising:

co-locating a marker block with the patient, wherein movement of the marker block

is measured to determine the physiological movement of the patient.

71.    The method of claim 70 in which the marker block comprises two or more markers.

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72.    The method of claim 69 further comprising:

predictively actuating a gating component.

73.    The method of claim 69 in which gating is performed based upon deviation from

10    periodicity of the movement data.

74.    The method of claim 69 in which gating is performed based upon movement signal

data exceeding a threshold in the range interval.

15    75.    The method of claim 69 in which gating is performed based upon phase of the

physiological movement.

76.    A system for patient positioning, comprising:

a marker block having a plurality of identified landmarks;

20        one optical camera positioned to view the marker block; and

a computing device to calculate position and orientation of the marker block based

upon viewed location of the identified landmarks by the one optical camera.

77.    A method for identifying position of a patient, comprising:

co-locating a marker block with a patient, the marker block having a plurality of

identified landmarks;

5          viewing the marker block with a single camera;

produce image coordinates for the identified landmarks viewed by the single camera;

comparing the image coordinates with reference coordinates for the landmarks; and

determining the position and orientation of the patient;

10    78.    An interface for prompting a patient in a physiological activity, comprising:

a computer-generated image configured to show visual real-time feedback for the

physiological activity;

the computer-generated image configured to show a desired range for the

physiological activity; and

15          the computer-generated image simultaneously showing the desired range and the

visual real-time feedback to prompt maintenance of the physiological activity within

the desired range.

79.    An interface for prompting a patient in a physiological activity, comprising:

20          a computer-generated image configured to show visual real-time feedback for the

physiological activity;

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the computer-generated image configured to show a desired range for the

physiological activity; and

computer-generated verbal prompting to instruct maintenance of the physiological

activity within the desired range.

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